ORIGINAL - signed

RECEIVED
NOV 27 1998
FCC MAIL ROOM

Before the
Federal Communications Commission
Washington, D.C. 20554

DOCKET FILE COPY ORIGINAL

In the Matter of
Proposal for Creation of the Low Power FM
(LPFM) Broadcast Service

FCC RM-9242

Reply COMMENTS of David Hollfelder

In REBUTTAL to those Parties, Associations, Foundations, & Otherwise Allies of the NAB , or "NAB Consortium" (Heretofore referred to as the NABC)

Dear Author & FCC Reviewers

Forward

I can honestly say "one simply cannot ignore the certain presence of impending change", so in my interest for the betterment of my fellow man, I offer some vision so that others may see.

Herein lies the seeds of yet another "landmark" change in communications.

In these Reply Comments, allow me to state that I've participated in this rulemaking process In "comments to RM9242 by David L. Hollfelder", in support of LPFM/uB. I clearly assert that I did so in "good faith". Such was not the case from the NABC.

In "this" material, I regret (but am not apologizing) to have been forced to use some very strong language (not cuss or vulgar), and "mean every word of it".

Major Points in this Reply Comments Document

- To Support Authorized / Licensed LPFM Service, and at an Effective Power Level as described in RM-9242 by Rodger Skinner.
- Rebuttal of the NABC's "misinformation" campaign of unsubstantiated claims of
  a) IBOC
  b) that FCC will be "overwhelmed"
  c) Interference
  d) NABC's Mudslinging, Slandering, Predatory & Exclusionary Tactics
  - The operative of the NABC
  e) The LPFM/uB DOES fill a need and has a purpose to be a licensed service.
- The NABC makes the false assumption that they are the sole qualified advisors to the FCC rulemaking process.
- The only objectors to the LPFM/uB service is the NABC.
- We said Affordable and Doable, not cheap and haphazard

No. of Copies rec'd 0+9
List A B C D E MMB

- **Support Authorized / Licensed LPFM Service, and at an Effective Power Level.** Referring to RM-9242, Rodger Skinner has described a wide range of Power Levels and Services from "Event Broadcasting" through LPFM-1 (3Kw at 328 feet HAAT).

  After studying these scenarios, My conclusion is; this will allow for virtually any level of LPFM to perform as intended. Such "**Substantial**" power levels **are required**, and such should be authorized as in RM-9242 with one "exception" described in the following paragraph. Service levels of a "few watts" (as has been heard "over the wire"), will encourage "CB"ization (we in LPFM don't want 5 watt "CB" FM Stations On The Air).

  In exploring the matter of the "few watt CB" FM station, I propose an "change" of the LPFM-2 specification to be at a minimum of 25 Watts (transmitter power), at 40 feet HAAT.

  The purpose of this change is "twofold"

  1) **To make this Radio Broadcast Service "just beyond" the conspicuous buyer-To prevent a "Killer App" or "Wiz-Bang" product from the retail world such as Radio Shack from "mass marketing" and making these "things" too easy for the "wrong" people to get. Such an occurrence would be "disastrous", as we aim to attract "the few - the quality" broadcasters, and not "necessarily" for the commerce of radio retailers. Additionally, the buyer of the "too low" power transmitter will be likely to add a "budget" RF amp., and an interference problem is likely to occur.**
  2) **To assure a "quality" decision on the part of the broadcaster. (Quality is Quality - Cheap is Cheap. We Never Said Cheap)**

- ***Rebuttal of the NABC's "misinformation" campaign of unsubstantiated claims.***

  a) **IBOC** (In-Band On-Channel Digital Audio Broadcasting). **("NOT")**

  High/Higher fidelity audio using digital transmission and processing digital data at the receiving end is not possible via the FM band.

  i) Such performance is not being achieved over ethernet (PC - IP networking, which has much higher bandwidth and throughput than IBOC has). Additionally, IP networks have the ability to retransmit "bad" data in a timely manner as to keep the processed data "streaming" - IBOC does not have this capability. Digital audio processing requires a very low Bit Error Rate (BERT). If the bit stream is corrupted because of a too high (BERT) (as often happens with multipath interference), there is no recovery of the lost digital data, and the audio processing "breaks-up".

  ii) IBOC in the FM band does not support the bit stream rate needed, nor does it offer diverse/redundant signaling (as DTV will have) because it would require too much bandwidth. Current testing of IBOC is now using bit stream rates of 96Kbs (down from 256Kbs because a reliable bit stream at 256Kbs was not possible), further degrading the performance. This scenario cannot support a reliable & quality digital signal, nor can it offer CD quality.

  iii) The "established" FM broadcast community in the USA has "little confidence" and are "alienated" by Digital Audio Broadcasting (DAB) in general and by IBOC in particular (they just won't admit it in public - but they've been heard "in the halls").

This whole issue of IBOC was "all but dead" until the LPFM/uB appeared, it's being used merely to "block" LPFM/uB.

iv) As for DAB, the only "seemingly" acceptable performance is from Eureka 147 (not IBOC), an L-Band / Microwave based system, and has found worldwide acceptance. The use of DAB via Eureka 147 would require some spectrum re-allocation as the L-Band is in use by the U. S. Government.

It is these Re-Allocation and Fork-Lift of technology issues that has the NABC holding on for "Dear Life" (FM radio does not want to experience the "devastation" like AM had when FM finally caught on). These are false fears because traditional FM Stereo broadcast is as good and more durable than DAB even under the best conditions.

IBOC/DAB is not needed or demanded, however they (NABC) must participate (at great cost) to "Save Face" in the public's (and "Global") "perception".

The NABC's arguments & claims of **IBOC is "Pure Smoke & Mirrors"** - Completely Invalid (they discredit themselves by making this "lame" claim).

b) The FCC will be "overwhelmed" ("NOT")

As stated in my Comments for RM-9242, the issue of conformance, monitoring, & problem resolution is doable and addressed in a "zero budget" impact to the FCC. See "The Local Area Microbroadcasting Coordinator" in my Comments to RM-9242.

c) Interference ("NOT")

Again, as stated in my Comments for RM-9242, before licensing, the micro-broadcaster will have to prove their technical qualifications, or know when they need it, and have it available to them. All equipment will adhere to the same "world class" quality specifications regarding frequency stability (PLL referenced), harmonic (filtering), modulation (spurious emission(s) prevention), etc. as any other broadcast station is required to meet.

d) NABC's Maligning & Slandering - and using Predatory & Exclusionary Tactics - To "Monopolize" the Broadcast Spectrum -

(this will likely attract "Anti-Trust" attention)

The operative of the NABC is to utilize a host of hired attorneys & "legalese" (legal sleaze), start an "alarmist - jump on the bandwagon" craze, compile a large list of names in support of their opposition (which is to have the FCC deny this LPFM/uB service) - with NONE of the alleged opposing parties authoring & directly participating in the process. This is quite "rude" to the regulatory process, the broadcast community, & the public in general, and blatant DISRESPECT in particular.

This issue cannot be treated as a civil or criminal case whereby the use of "Invalidation", "Intimidation", "Character Attacking", "Discrediting", & etc. for the effect of convincing a Judge or Jury.

Any Citizen of the USA has as a "right" to have input as to how "our" airwave spectrum is to be used AS MUCH AS anyone else has. Any individual or organization who denies this fact either by word or deed is very much in error (in direct rebuke of the very foundational premise of this country)!

Under no conditions should anyone attempt to create an environment with the intent to have the whole established broadcast community, and FCC to "close their mind" and not "hear us out".

The NABC's tactics are totally "Implausible". The type of "Emotional/Mob Mentality" the they have now injected into this "very serious and valid" process will only serve to "fan the flames ".

Truly, this cause for LPFM/uB service will NOT go away.

Finally, on this blasting of the NABC's actions, the purpose to have our cause "heard", not "acceptance" by the NABC (they're obviously still in denial). Our hope is to keep this LPFM/uB service - licensing process on track, with the FCC and "some" of the broadcast community acting in "good faith".

- **The only objectors to the LPFM/uB service is the NABC.**
  It's clearly evident that a highly funded PAC/Lobby is at work, forcibly "interfering" with what would be "doable" with benefits to many.

- **The NABC makes the false assumption that they are the sole qualified advisors to the FCC rulemaking process**. "All-the-More" evidence of their "tunnel vision" and "brute force" attitude & actions.
  The LPFM/uB constituents are knowledgeable and highly qualified in broadcasting.

- **We said Affordable and Doable, not cheap and haphazard**
  The Cause & ***Mission Statement*** of LPFM/uB is NOT to condone "bad" broadcasting. (as the NABC would assert regarding all LPFM broadcasters).
  As stated in my comments for RM-9242, the stated platform was **"Responsible Operation for Profit or Non-Profit via Accepted Engineering & Program Practice, achieving such at a level of Excellence, and at an affordable price for those not having unlimited resources."**. Such professional broadcast quality equipment is available today (such as Veronica FM from the UK, which several hundred licensed stations worldwide are using. In this case offered as "turn key" units, or as "kits" with the same level of quality). Only such equipment, requiring a sizable **Financial Commitment** would be used by the "serious broadcaster" as well as the implied **Character Commitment** to broadcasting and the community.
  The operators of the so called "cheap & dirty" (a.k.a - the couple hundred dollar rig - such as a Ramsey with an RF amp -), or equipment scenarios such as those that were allegedly causing aviation (and other) interference, were never the intended users of this LPFM/uB service. (we state clearly that such stations should not be transmitting under any conditions). The "Hack" broadcaster does not demonstrate the expected "commitments", nor do they meet the criteria of our Mission Statement.

- **The LPFM/uB DOES fill a need and has a purpose to be a licensed service**, to the local

listeners/community and has a viable reason to exist. This special local service was lost as the "great consolidation" of broadcasting entities occurred in recent years that "took away personal ownership" that no corporate culture can replace (regardless of their claims to the contrary).

As with any large organization, "lowest common denominators" & "optimum market presence" are the rules that must prevail in order for it (expensive cost of existence and profitability) to survive.

These characteristics leave out the local niche parts of the local community.

LPFM/uB service has a purpose to fill this need.

==========

See the following for:

a) **Information in support of the conclusion that In-Band On-Channel will not work.**

b) **Official Author's Information and Signature.**

The following information is supporting information for the conclusion that In-Band On-Channel will not work.

(how his concept has been in the prototype stage for many years, and has done "poorly", lackluster participation by the broadcast industry, IBOC's poor performance, as well as all other digital audio broadcasting in the FM band, and the extremely long development cycle clearly indicates this is not a viable vision for the FM broadcast band.)

Counterpoint to NAB (and other's) case for IBOC

The following Documentation INVALIDATES NAB's argument for IBOC,

and supports Our conclusion that

**** IBOC and DAB in the Commercial FM Band Is a DEAD issue ****

We contend that ALL arguments by NAB and "others" who object to and LPFM service

who have commented to the FCC to

deny LPFM service on the basis of inhibiting IBOC "Irrelevant".

The EUREKA 147 system operating in the L-Band (a microwave band) is the ONLY system that has had acceptable performance test results. **This PROVES that DIGITAL AUDIO BROADCASTING is only substantially possible in the microwave spectrum** which has the bandwidth and acceptable multipath interference properties needed.

Once again, let me re-iterate

**** IBOC and DAB in the Commercial FM Band Is a DEAD issue ****

DIGITAL RADIO RESEARCH (DRRI) INC.

EIA/NRSC DAB SYSTEM LAB TEST RESULTS: AN ASSESSMENT

***** Eureka 147 outperforms all in-band systems! *****

KEY FINDINGS

The **Eureka 147 System produced results that were far superior to any of the IBOC systems** with respect to **audio quality, signal reliability and non-interference** to existing analog services.
FM IBOC systems would produce unacceptable interference to their "host" FM station, as well as to nearby stations that operate on adjacent frequencies.
AM and FM IBOC systems would produce substantially-reduced service coverage, compared to that of their analog "host" stations.
The performance of FM IBOC systems degrades considerably, even to the point of failure, in the presence of multipath.
The AM IBOC system cannot provide CD-Quality audio and produces impairments that expert listeners judge as "annoying".

BACKGROUND *(some these test results are indeed "dated", however, little (if any) progress has been made to improve the reliability, quality, & range of IBOC/DAB in the FM Band)*

On August 22, 1995, the Digital Audio Radio Subcommittee of the Electronic Industries Association (EIA) released the results of independent laboratory tests conducted on seven proponent Digital Audio Broadcasting (DAB) systems. (Two systems operated in two modes each, making for nine tests in total.) Measurements and related audio recordings for each system were made at NASA's Lewis Research Center (LeRC) in Cleveland OH. Subjective assessments of the audio recordings were carried out at the Communications Re-search Center (CRC) in Ottawa ON, under contract to the EIA. These tests are the first time all proposed DAB systems were assessed by an independent body using the same evaluation criteria.
This report outlines conclusions drawn by Canadian DAB experts who have reviewed the results and were present at a technical tutorial session in Monterey, California, from 24-25 August 1995.

TESTS PERFORMED

The main purpose of the laboratory tests was to **determine the basic digital audio quality produced by each system, its reception reliability, and its ability to co-exist with other stations, including the "host" analog station**. In co-operation with the National Radio Standards Committee (NRSC), the EIA developed a complex series of tests to determine these factors. Each proponent had the opportunity to propose system-specific tests that would

best illustrate its operating features. All system proponents took an active part in the subcommittee that developed the testing procedures. Each system was operated in accordance with the developer's specifications and tests were conducted using DAB encoders and receivers that were supplied by the proponents themselves.

SYSTEMS TESTED

The DAB systems (and modes) listed in the Appendix were evaluated in the EIA tests. All comments and observations in this report relate only to the first seven system proponents listed. i.e. **Eureka 147 and the six In-Band On-Channel (IBOC) proponents. The AT&T In-Band Adjacent-Channel (IBAC) system is not a serious contender for a North American standard, as it utilizes adjacent FM channels and evidently would require significant frequency re-shuffling in most markets to make it practical.** The VOA/JPL system is not discussed, since it is designed for satellite-delivered DAB in the 2.3 GHz band, allocated only in the USA and India.

TEST RESULTS

- When the basic digital audio quality of each proponent is assessed in a lab setting, using strong signals and no induced impairments, the ratings for all system proponents, with the exception of the USA Digital AM IBOC system, are quite similar.
  The Eureka 147 system (224 kbits/sec) rated the highest of all, even though the two USA Digital FM systems employ a higher data rate (256 kbits/sec) and use the same MUSICAM audio coding system.
  Even with strong signals and no interference, the USA Digital AM IBOC system suffers audio quality impairments that experts judge to be "annoying"; consequently, this system is not capable of providing "CD-Quality" DAB service.
- **Although all DAB receivers require time to recover when signals fail** or listeners change frequencies, the recovery **time of IBOC receivers is far too long to be practical in a real-world environment.**
  The Eureka 147 system generally recovers from signal loss in 1 second or less.
  The IBOC systems can take from 5-9 seconds to recover.
- When tested with five common household, portable, and auto receivers with known operating characteristics, **IBOC FM DAB produces significant impairments to existing analog services** on first and second-adjacent channels.
  In a majority of the tests, expert listeners judged the stereo FM analog service to be "worse" or "much worse" when an adjacent-channel station, carrying an IBOC DAB service, is present.
  This interference tends to worsen when multipath occurs.
  FM stations operating one channel apart on the dial are said to be "first-adjacent", while those that are separated by two channels are "second-adjacent".
  Multipath interference occurs when FM signals reflect from large objects, such as buildings and mountains, causing several time-delayed versions of the same signal to arrive at the receiver.
- When tested with five common household, portable, and auto receivers with known operating characteristics, **IBOC FM DAB produces a significant impairment to the quality of the FM stereo audio on its "host" analog station.**
  IBOC signals produce objectionable background noise in FM analog receivers. Many of the test reports from expert listeners said that the **quality of the FM stereo analog service was "worse" or "much worse" when the station was carrying an IBOC DAB signal.**
  IBOC impairments to the FM stereo service are more substantial on home tuners than on auto receivers, probably due to the reduced bandwidth of the latter.
- **If two FM stations having a first or second-adjacent channel relationship** (and standard geographical spacing) **were both to implement IBOC, their useful DAB service areas would be significantly less** than their analog coverages (up to 32% for first-adjacent Class C1 stations), in the zone between the two stations.
- **FM IBOC system performance and interference impairment worsens significantly in the presence of multipath.**
  Of the IBOC systems, the AT&T/Amati system performed best in a multipath environment, although **failures still occurred** under certain conditions.
  The USA Digital FM-1 and FM-2 systems generally produced degraded performance (or failed completely) whenever multipath was added to the signal.
- If two neighboring first-adjacent-channel AM stations were both to implement IBOC DAB, the digital signals would fail wherever the desired station's signal is not at least 34 times stronger than that of the undesired station.

Many AM stations in urban markets would experience DAB coverage that is substantially smaller than their AM service areas.
Nighttime AM DAB service would likely be impractical for most stations, due to the presence of strong adjacent-channel skywave signals.

CONCLUSIONS

The independent test results provided by the EIA confirm that the digital radio concept that Canada has developed (**Eureka 147 in a new band at 1452-1492 MHz**) will indeed provide the highest quality DAB service. The tests showed the **Eureka system to be far superior technically to any other proponent system** and confirm the extensive evaluations conducted in Canada and Europe since 1990. Moreover, as Eureka 147 will operate in a new band, it automatically avoids any impairments caused to, or suffered from, existing analog services. **The In-Band systems showed particularly badly with respect to the key attribute their proponents have always touted - their ability to co-exist in the AM/FM bands without causing interference to analog services.** Demonstrations in carefully controlled environments may have produced promising results previously. But the **independent lab tests show that IBOC fails when it is operated using simulations of real-world impairments, such as multipath and adjacent-channel interference.**
The next step in the evaluation process is to examine system performance in the field. Current plans of the joint EIA/ NRSC testing committee call for this to be done in the San Francisco area later this Fall.

APPENDIX

System Name	Source Coding	Data Rate	System Type	Proposed Band Used Tested(kbits/sec)
Eureka 147	MUSICAM	224	New-Band	1452-1492 MHz
Eureka 147	MUSICAM	192	New-Band	1452-1492 MHz
USA Digital FM-1	MUSICAM	256	In-Band, On-Channel (IBOC)	88-108 MHz
USA Digital FM-2	MUSICAM	256	In-Band, On- Channel(IBOC)	88-108 MHz
USA Digital AM	MUSICAM	92	In-Band, On-Channel (IBOC)	525-1705 kHz
AT&T/Amati LSB	PAC	128	In-Band, On-Channel (IBOC)	88-108 MHz
AT&T/Amati DSB	PAC	160	In-Band, On-Channel (IBOC)	88-108 MHz
AT&T	PAC	160	In-Band, Adjacent Channel (IBAC)	88-108 MHz
VOA/JPL	PAC	160	Direct Broadcast Satellite	2310-2360 MHz

For more information contact Wayne Stacey at (613) 830-6985.

(More Invalidating Documentation for the NAB's and other's cases)

Lack of Broadcast Volunteer Causes IBOC System to be Withdrawn from Field Testing

IBOC Future Unclear

ARLINGTON, VIRGINIA, September 18, 1996. AT&T/Lucent Technologies and Amati Communications Corp. informed the Consumer Electronics Manufacturers Association (CEMA) last week that they were removing their in-band/on-channel (IBOC) digital audio radio (DAR) system from field testing consideration **since no acceptable**

testing facility was available. The National Association of Broadcasters (NAB) had agreed to find a San Francisco radio station willing to host the experiments but was unable to find a volunteer station. The AT&T/Lucent Technologies/Amati Communications Corp.'s IBOC system thus joins those proposed by USA Digital Radio which last May also elected to remove its systems from further testing and evaluations.

These events follow the release of laboratory test data last year that revealed poor performance of IBOC DAR systems' audio quality, degradation of the host analog signal, limited digital coverage, and interference caused to existing broadcast stations. Some believe that these results show fundamental design problems with IBOC systems. IBOC system proponents have discussed how IBOC system re-designs may be needed, but it is unclear whether system changes can successfully cure any or all of these critical deficiencies.

"This FAILURE of BOTH system performance and real interest from broadcasters calls into question the future of IBOC. Further attempts to redesign the IBOC systems must be skeptically weighed against broadcasters' (lack of) interest in delaying digital radio and the realities of present-day physics. It may be time to look worldwide to others who are taking the lead in digital radio implementation as the U.S. continues to lose ground," said Gary Shapiro, CEMA president.

At this point three systems are undergoing field tests:

- AT&T/Lucent Technologies for its in-band/adjacent-channel (IBAC) system,
- Eureka 147 DAB system at L-Band, and
- VOA/JPL satellite system at S-Band.

CEMA has two experimental licenses issued by the FCC: one to conduct field tests at L-Band frequencies and another, experimental station, KEIA, which uses an FM broadcast frequency for the IBAC tests. The S-Band system is uplinked to NASA's TDRSS satellite from White Sands, New Mexico.

Field tests for the IBOC system were on hold until the NAB could meet its obligation to locate a host FM station. CEMA also had offered to co-locate the IBOC station with KEIA operations if no other existing station could be found. After two years of searching for a host station within the San Francisco Bay area, no local broadcasters came forward. In reviewing the KEIA option for IBOC field tests, AT&T/Lucent Technologies/Amati Communications Corp. found the transmission site (KEIA) at Mount Beacon to have an objectionable interference environment.

KEIA is located at frequency 96.9 MHz. A high-power FM station (see note 1) on a second-adjacent channel to 96.9 MHz is also co-located on Mount Beacon. Since IBOC systems use the first-adjacent channel to transmit their digital energy, a substantial filter would have to be used between the two adjacent channels, causing degradation of the IBOC digital signal. IBAC systems do not use first-adjacent channel frequencies, and therefore there is no digital signal degradation caused by filtering out a high-power, second-adjacent signal.

"CEMA and the NAB had been hoping for two years that a local broadcaster would come forward to host the DAR field testing, especially since it was in the interest of the broadcasting community to find an IBOC digital radio solution for the United States," commented Shapiro.

AT&T/Lucent Technologies is still pursing field testing for its IBAC system. Field testing for all three systems should be completed by early October.

The field tests are being conducted to complement the laboratory test results with data obtained under typical, off-air broadcast conditions. Measurements in San Francisco will quantify the received field strength, location and impairment performance over a number of mobile routes selected to examine the DAR systems' performance capabilities under varied over-the-air conditions. The laboratory tests were conducted last year at the NASA Lewis Research Center in Cleveland, OH by the Electronic Industries Association's (EIA) Digital Audio Radio Subcommittee and the National Radio Systems Committee's (NRSC) Digital Audio Broadcast Committee.

Note 1 : The issue of a co-located Second adjacent channel Full Power Station in the San Francisco area was somewhat of a "coincidental" subject in this matter of IBOC– However, however, it should be noted it carries pivotal importance in the support and validation for LPFM (which envisions the use of 2nd adjacent channel use-which the NAB and others argue against).
If Second adjacent channel Full Power stations "co-located" in the same general area WORK, then LPFM will too!

The NAB's and others arguments against 2nd adjacent channel use is invalid and should also be "IRRELEVANT"

World Deployment of Eureka 147 in L-Band

US IBOC is an attempt by the NAB to "keep" existing FM Service, and not "fall" like AM did to FM. Although a good idea in Concept, IT HAS FAILED.

1) The FM 100 Mhz band is not suitable for DAB
   a) has too much multipath interference for DAB
      DAB requires low - very low bit error rate (low-very low interference especially from a reflected-multipath source).
   b) lacks the bandwidth for DAB
      This has been proven time and again

**** IBOC and DAB in the Commercial FM Band Is a DEAD issue ****

Digital Audio Broadcasting (DAB)

The Eureka 147 Standard

Courtesy of the European Broadcasters Union (EBU)

Eureka 147 is currently used in Europe as the audio standard for Digital Audio Broadcasting (DAB). Great efforts have been made to have the FCC annex the standard for use in the US.
The Following is an excerpt from a document downloaded from the EBU Web Site.

Eureka 147

Compatible improvements to the Eureka 147 system

The Eureka 147 DAB system is recommended by the ITU-R (as *Digital System A*) for use in terrestrial and satellite digital sound broadcasting [1] [2]. It is also fully defined by the European Telecommunications Standards Institute (ETSI) [3].

The Eureka 147 Project which developed Digital System A is continuing to develop and refine its applications in new digital broadcasting markets. This has resulted in the development of additional features to augment the basic system specification.

Audio sampling rate

Some broadcasters - notably those intending to use Digital System A for satellite delivery of digital radio services - have expressed particular interest in the use of improved, low bit-rate, audio. This is in order to maximize the number of channels per ensemble, at the expense of the (normally CD-quality) audio.
The Eureka 147 Project has agreed to adopt a low bit-rate coding scheme, which is fully compliant with ISO/IEC MPEG-2 Audio Layer II developments. This provides for an audio sampling rate of 24 kHz, with 48-ms frames and audio bandwidths of up to about 11 kHz. Revised audio decoding chips are already in development and should be incorporated in DAB receivers within a year.

Transmission Mode IV

Studies in Canada, already submitted to ITU-R Working Group 10B, have indicated that some service scenarios implemented at L-band could benefit from an additional Transmission Mode which would provide a symbol guard interval of about 100 ms. Further studies within the Eureka 147 Project have concluded that a Mode IV can be added economically to the next generation of chips; key parameter values will have a binary relationship to those of the existing three modes. The parameter values of Mode IV will thus lie halfway between those of the existing Modes I and II.

1. ITU-R Draft Recommendation BS.1114: **Systems for terrestrial digital sound broadcasting to vehicular, portable and fixed receivers in the frequency range 30 - 3000 MHz.** ITU-R, June 1995.
2. ITU-R Draft Recommendation BO.1130: **Systems for digital sound broadcasting to vehicular, portable and fixed receivers for BSS (sound) bands in the frequency range 1400 - 2700 MHz.** ITU-R, June 1995.
3. ETSI Standard ETS 300 401: **Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers.** ETSI, February 1995.

Eureka 147 DAB triumphs in EIA tests

The long-awaited EIA?1 report on digital sound systems was published in Monterey, California, during late August 1995. Based on the results of extensive laboratory tests, conducted by the Radio Subcommittee of the EIA, this report heralded a major coup for the Eureka 147 DAB system. The EIA test data has confirmed the earlier results obtained by Eureka in conjunction with the EBU; the EIA results represent a resounding endorsement of the design and implementation criteria of the Eureka DAB Standard.
In the USA, various "IBOC??2" and "IBAC?3" digital radio systems have been proposed for use within the existing FM and AM bands. In stark contrast to the Eureka 147 system, **none of these options presented themselves in the EIA tests as viable systems** for the compatible introduction of digital audio broadcasting.? **All six in-band proposals showed major deficiencies in some if not most of the crucial performance and compatibility tests.**
Multipath is the basic problem for all IBOC/IBAC systems, although for some proposals this only becomes apparent when **realistic interference from neighboring stations** is also considered. Sample recordings of the compatibility tests demonstrated that **very annoying interference could be caused by each in-band** system to its analogue host, **when listening on all the consumer FM receivers used** for the tests.
As an own-band system, **Eureka DAB suffers none of these compatibility problems and all existing analogue FM and AM stations can continue untouched.** In fact, **in Europe, the CEPT has just completed a new spectrum allotment plan for DAB** - involving VHF Band III (216 - 240 MHz) and L-band (1452 - 1467.5 MHz). Many European broadcasters are now pressing ahead with Eureka DAB services (see page 6) and pilot trials. Additionally, Canada is poised to adopt the Eureka 147 system formally - following extensive - - - testing, broadcast trials and frequency planning - and other countries worldwide are also opting for Eureka DAB.
In the EIA tests, Eureka DAB - using ISO/IEC MPEG Audio Layer II coding at 224 kbit/s - provided the best audio quality, being virtually transparent to the digital source signals; these were especially selected to be very demanding. Eureka DAB also required the lowest power to perform successfully in the noise, interference and multipath simulations (for which it was designed), in some cases being as much as 1000 times (30 dB) better than the in-band systems.

The EIA is to be complimented on its thorough and professional efforts in designing such comprehensive tests that stressed all the systems to breaking point; in one of the multipath scenarios, the Eureka DAB system was taken to just beyond its design limit.
Whilst many countries around the world are already using or conducting trials on the Eureka DAB system for their own digital radio services, the USA has adopted a much more cautious approach. The EIA preferred the classical route, starting with a well-planned campaign of comprehensive laboratory tests on all the system proposals that were submitted, to be followed by extensive field evaluations in a real broadcasting environment. Although the EIA Subcommittee has chosen well in deciding to use the greater San Francisco area - with its varied mix of terrain and urban clutter - for the off-air trials, this phase of the tests has still not started yet; red tape looks like making the saga run on and on! (SEE PREVIUOS ARTICLE Lack of Broadcast Volunteer Causes IBOC System to be Withdrawn from Field Testing) Nevertheless, Eureka is eager to take part in this second phase of the EIA tests. In a joint effort with DRRI?4 of Canada, Eureka has planned a 3-transmitter SFN to cover the whole of the San Francisco area; it will operate in L-band, using a total E.R.P. of 500 W.

On-air

Denmark

The first official DAB service in Denmark was launched on 1 September 1995 by Danmarks Radio (DR). Using just a single 500 W E.R.P. transmitter, DR is providing a 24-hours-a-day DAB service to the Copenhagen area. The afternoons are given over to a new classical music program; at other times the DAB transmitter broadcasts a mix taken from the three existing Danish FM programs. The DAB service is simultaneously transmitted on 102.3 MHz VHF/FM, a frequency which has been "borrowed" from an unused fourth national channel.
At present, old test equipment is being used while we await the supply of new equipment from ITIS?5 of France. We plan to be on-air with two DAB transmitters, both in the Copenhagen area, from 1 January 1996. By then, all four programs will be broadcast on DAB. Normally, the bit rate will be 256 kbit/s but greater and assignable bit rates will also be used at certain times. The equipment allows for eight programs in an ensemble.
DR has permission to transmit DAB in the Copenhagen area until the end of 1997. It has applied to the relevant Danish authority for permission to transmit DAB also in Western Jutland (the home of Bang & Olufsen) and expects to receive permission for this service. DR is the only national broadcaster in Denmark and the only organization that is interested in providing a nationwide DAB network. Experience of DAB coverage is needed, from both a city and a countryside perspective. It is expected that the time-limited permission granted at present will eventually become an unlimited permission.
At the recent CEPT Planning Meeting in Wiesbaden, Denmark was allocated 227.360 MHz for national DAB coverage. The Copenhagen transmitter started on that frequency on 1 September 1995 but we found that it was causing interference to television receivers tuned to Channel 12 on the local cable network. Consequently, we are now back on 237 MHz, which was used for earlier test transmissions. This problem has to be resolved by 1 January 1996 at the latest, when we will be obliged to transmit on 227.360 MHz - - - only.
At present, there are only three DAB receivers in Denmark, all made by Philips. DR has plans for the distribution of 500 receivers as part of a controlled evaluation. The realization date for this has not yet been fixed, due to the present shortage of receivers and unsolved financial issues.

Steen Jensen, Chief Engineer, Danmarks Radio, Tel: +45 35 206718, Fax: +45 35 206755

Sweden

At a meeting on 21 September 1995, the Swedish Government allotted the frequency range to be used for DAB transmissions in Sweden. The Swedish Broadcasting Corporation (SR) will have total use of the available frequency range for nationwide DAB transmissions and a third of the frequency range available for regional DAB services. The rest of the regional frequency range will be shared among the Swedish commercial radio companies.
On Wednesday 27 September 1995, the first DAB service in Sweden was inaugurated from a transmitter serving the Stockholm area. In the summer of 1996, further transmitters covering Greater Stockholm, Gothenburg and Malmö, as well as an unspecified sparsely-populated area, will be in operation. Within a couple of years, the DAB network is expected to cover the whole of Sweden.

For a transitional period of several years, the FM network will be used in parallel with the new DAB network, but will be closed down eventually.
DAB makes it possible for SR to offer a larger choice of programs and other services to its listeners. Furthermore, DAB has a lower energy consumption than that of the current FM network.

Swedish Broadcasting Corporation, Information & Marketing Department, Tel: +46 784 50 00

United Kingdom

Liz Forgan, Managing Director of BBC Network Radio, switched on the BBC's national DAB service on Wednesday, 27 September 1995, describing the occasion as an historic day: *"It's the dawn of the third age of radio, the technological progression from AM - which is now 100 years old - and FM - now 50 years old - into the digital multimedia world of the 21st century. Consumers will get superb quality sound, a strong and fade-free signal, and a whole range of new services on simple easy-to-use sets. DAB puts radio on the digital highway, which will mean it can retain its place as a vibrant, creative, informative and flexible medium in the new communications age".*
The switch-on means that, in addition to analogue transmission on FM and AM, all BBC national networks will be carried on DAB - Radios 1, 2, 3 and 4 in high-quality stereo and Radio 5 Live in high-quality mono. However, DAB technology also enables the BBC to carry additional programs and, in its introductory service, three extra areas of programming are being carried by the DAB transmitters - live broadcasts from the House of Commons, extra sports commentaries, and programs from BBC World Service.
Liz Forgan emphasized that the BBC's decision to switch on in 1995 is part of the Corporation's strategy to push DAB forward. *"Starting now, during the prototype stage of receiver manufacture", she said, "is a strategic move to signal a determined commitment and to build the consumer interest which will give the receiver manufacturers a market. The BBC is no stranger to this pioneering role. It was the same when we started black and white television in the thirties, and color television in the sixties".*
During the introductory period, the BBC will be experimenting with its editorial service and sounding out the views of listeners through extensive market research. *"By being in at the very beginning of DAB, we are uniquely placed to influence its development and build the kind of radio service listeners of the future will value"*, Liz Forgan added.
The initial BBC DAB service covers 20 % of the population, with five transmitters in the Greater London/M25 motorway ring-road area. This will grow to 60 % of the population by March 1998, as a further 22 transmitters come on-air.
Also announced on 27 September was a new service, unique to BBC DAB, which will be launched in 1996. "BBC NOW" will provide succinct information, night and day, with a rolling 10-minute package of news and business headlines, sport, weather, traffic and program information. BBC NOW will be the embryo of future audio- on-demand services. It has the potential to form the basis for a fully-selective service, offering text as well as audio. Listeners would be able to decide - at the push of a button - which type of information they are interested in receiving, rather than accepting the broadcaster's schedule - for example, it will be possible to bypass the sports results in order to receive the latest financial news.

Jane Futrell, BBC DAB Public Affairs, Tel:+44 171 765 4467
Sue Lynas, Chief Publicity Officer, BBC Radio, Tel:+44 171 765 4990

Satellite DAB

Satellite test transmissions of DAB in Mexico

During the period 17-21 July, BBC Research and Development - in collaboration with Telecomunicaciones de Mexico and the Instituto Mexicano de Communicaciones - carried out highly-successful satellite reception tests on Eureka DAB in the suburbs of Mexico City, using test transmissions provided by the Solidaridad 2 satellite.
High-quality audio transmissions were successfully received from the satellite by both a fixed receiver and in a moving vehicle. This was the first test of mobile satellite reception using the Eureka 147 system.
The Solidaridad satellite system - which comprises transponders operating in C-band, Ku-band and L-band - provides a number of domestic and regional services in Mexico. In particular, the L-band payload has been designed for multicarrier use: it provides voice, fax, data and positioning services for aeronautical, maritime and land-mobile commercial applications. There are also services to transportable or semi-fixed terminals in remote areas of Mexico.

The L-band frequencies used in Mexico are just above those designated for DAB by the ITU (1452 - 1492 GHz); the availability of Solidaridad 2 gave an excellent opportunity to test Eureka DAB via an L-band satellite.
Even though the DAB signal is very different from the signals usually handled by the Solidaridad satellite, it was received without distortion - thus verifying the feasibility of satellite DAB for both national and international transmission of CD-quality radio to fixed, portable and mobile receivers.

Alan Lafferty, BBC Engineering Information, Tel: +44 181 231 9171, Fax: +44 181 231 9177

Equipment

EACEM states its position on DAB

EACEM?6 is strongly supporting the principle of a single European Broadcasting Market, both for television and radio. The application of this principle will be of great benefit to the consumers, the receiver manufacturers and the broadcasters, and will allow the use of the same services and systems throughout Europe. The consumer must be protected from the need to acquire a multiplicity of "boxes"/decoders in order to receive a number of similar services.
The most appropriate way to achieve these objectives is to create a system of harmonized European Standards. This should consist of only one standard for the source coding and one modulation standard for each method of delivery (satellite, cable, terrestrial). There should be maximum practical commonality through the use of transparent frequency conversion. In the case of television broadcasting, considerable progress in this direction has been achieved already. In the case of radio broadcasting, similar achievements are still pending and appropriate market-oriented steps must be taken to arrive at a comparable situation.
Applying the principle of maximum commonality to the modulation standards would allow the consumer to use the same receiving equipment for the different methods of transmission. This is particularly important in the case of terrestrial and cable transmission, as they share the same frequency spectrum.
For the transmission of digital radio signals over cable networks, EACEM supports both the use of terrestrial DAB COFDM signals (T-DAB) and distribution using the 64-QAM system. The reasons are as follows:

- if T-DAB signals are distributed transparently over cable networks, the consumer would be able to use a T-DAB receiver for either direct terrestrial reception or for reception via the cable network;
- small cable systems could distribute the T-DAB signals direct, to avoid expensive investment in 64-QAM equipment;
- the 64-QAM system uses the frequency spectrum efficiency and offers commonality with the digital video broadcasting (DVB) cable specification.

Finally, EACEM has invited the European Commission to support the measures outlined above, to prevent further fragmentation of the radio/television market.

Georg Lütteke, EACEM Technical Committee, Tel: +49 69 63 02 260, Fax: +49 69 63 02 317

Blaupunkt

Blaupunkt Werke GmbH - the consumer electronics subsidiary of Robert Bosch GmbH - is supplying a new generation of DAB car radios for use in the various field trials currently taking place. Compared to their predecessors, the new generation of DAB receivers use large-scale integration and offer improved performance characteristics. All of the DAB-specific functions are integrated in an additional box which can, for example, be installed in the car boot in a similar manner to that of a CD changer.
The add-on DAB box and the audio reproduction are controlled by a conventional FM car radio; the DAB unit is hooked up to the car radio by means of a CD control cable. (With such a configuration, it is still possible to connect a CD changer if required.) In order to meet the different individual requirements, the DAB box will be offered in two versions: a basic "audio" unit and an extended "audio and data" version. In both versions, the DAB car radio unit is compatible with the ETSI Standard, ETS 300 40- - - 1.
The frequency ranges covered by the Blaupunkt DAB receiver are Band III (174 - 240 MHz) and L-band (1452 - 1492 MHz). The L-band converter is integrated in the RF input stage. Transmission Modes I, II and III are supported. The new Transmission Mode IV (see page 4) may be implemented as soon as the system parameters are available.

Audio version

The basic version of the Blaupunkt DAB receiver has been primarily designed for audio applications. In addition, it allows the user to take advantage of different services (audio and data services) with a data rate of up to 500 kbit/s. There are two digital interfaces which enable external devices, such as a PC notebook, to access the data:

- a serial optical interface;
- a serial asynchronous interface.

With the asynchronous interface, the user has access to Program Associated Data (PAD) or packet-mode data telegrams. The PAD is available at a data rate of up to 2 kbit/s and the packet-mode data is transmitted at a rate of up to 38 kbit/s. In this context, the maximum data rate of the serial interface is determined by the PC rather than by the DAB receiver.

Audio and data version

Besides the reception of audio programs, the extended version of the Blaupunkt DAB receiver allows the user to receive and display additional services such as still pictures or text applications via an add-on color display.
This version of the equipment makes it possible to receive those services requiring the entire DAB data stream (up to approximately 1.7 Mbit/s); this bit stream is made available to external equipment via the serial optical interface.
In addition to the user-selectable transmission of the PAD and packed-mode data described above for the basic audio version, the serial asynchronous interface also provides stream-mode and "variable size" XPAD data (extended PAD, with a data transmission rate of up to 4 x 1- - - 6 kbit/s). The data rate of this port will be mainly limited by the external device which, in most cases, will be a PC (capable of processing data at rates of up to 38 kbit/s).
By using an additional PC plug-in board with the receiver (also available from Bosch), it will be possible to enhance the spectrum of PC applications and to exploit the available data information to the full. This supplementary board receives the data from the DAB receiver through the serial optical interface. The user selects the required data which is then processed accordingly and made available at the internal PC bus (ISA bus) for further use by the PC.
When using the extended version of the DAB box with a PC, the system also supports the implementation of a graphical user interface to control the DAB receiver from the PC.

Dr Thomas Lauterbach, Robert Bosch GmbH, Tel: +49 5121 492118, Fax: +49 5121 492520, E-mail: lauterbach@hic334.decnet.bosch.de

Grundig

DCR 1000 DAB pilot receiver

The Grundig pilot receiver DCR 1000 DAB is fully compatible with the ETSI European DAB Standard, ETS 300 401. In addition to evaluating the Fast Information Channel (FIC), this first- generation pilot receiver enables the simultaneous decoding of two services, for example an audio program and a data channel. A separate digital interface, which conforms with the RDI specification of the Eureka 147 Project, is provided for connection of an external data terminal.
The presently-available DAB components - developed in the course of the Jessi AE14 project - do not yet allow the integration of the DAB receiver into a conventional car radio. The DCR 1000 DAB receiver is therefore located in a separate housing and can either be mounted in the boot of the car or under a seat. The Grundig car radio WKC 5300 RDS - which has been especially prepared for this purpose - allows the operation of the DCR 1000 DAB receiver via a control cable and; if provided, allows the operation of a CD changer as well.
As shown in Fig. 1, mobile DAB receivers which are fully- integrated in a DIN housing are expected to become available towards the end of 1998. The market for fixed receivers, however, is expected to develop quite slowly as there is no great DAB argument in support of improved quality here. In addition, it remains to be seen how that particular market will react to Astra Digital Radio (ADR) which is due to enter service shortly.

Kenwood

The Kenwood Corporation of Japan is launching a DAB test receiver and test decoder in Europe during February 1996.
The advantages of DAB strongly suggest that it will first penetrate the automotive market, although it is only a matter of time before it becomes established in the home as well. Simultaneously, a large market is expected to develop for non-consumer DAB-related products - in particular, test and measurement equipment.

In January 1994, Kenwood joined the Eureka 147 Project. As well as becoming involved in DAB promotional activities, the company has engaged in R&D and product development for non-consumer test equipment and consumer receivers. Two new DAB non-consumer products are scheduled to become available in February 1996 and are briefly described below. Consumer car and home receivers will follow at a later date.

DAB test receiver

The Kenwood test receiver has been designed to enable technicians in the field to check DAB reception. In addition to receiving audio signals and data, it enables error measurement, frequency selection using a numeric keypad, monitoring of reception status, and the decoding of transmission modes (transfer rate, protection level, etc.). It is also able to display the current program type, current language, etc.
The price of the Kenwood test receiver will be approximately 500 000 Yen (4400 CHF).

DAB encoder

The Kenwood DAB encoder (pre-production reference number LZ-23) generates test signals compatible with the Eureka 147 DAB system. It can deliver digital/analogue I & Q signals using OFDM modulation at a frequency of 39 MHz.
The price of the Kenwood DAB encoder will be approximately 3 000 000 Yen (26 400 CHF).

Prototype car receiver

Eureka DAB is particularly suitable for audio reception in moving vehicles and the Kenwood prototype car receiver (reference number LZ-24) makes the most of this potential. Mounted remote from the dashboard, for example in the car boot, it can receive data such as traffic information as well as audio signals, on all of the frequencies currently proposed for DAB transmission in Europe.

Kenwood Publicity Office (Tokyo), Tel: +81 3 5457 7120, Fax: +81 3 5457 7110
Kenwood Electronics Europe B.V., Tel: +31 2975 68721, Fax: +31 2975 69896

Mitsubishi

MPEG-1 Audio Decoder

The MPEG-1 digital audio standard (ISO/IEC 11172-3) was defined in November 1992 and is used in multimedia audio systems such as DAB, video CD, digital TV and CATV.
Mitsubishi Electric has developed an MPEG-1 audio decoder which will decompress audio which complies with the MPEG-1 standard (Layers I and II). The decoder has been implemented on an LSI chip and two versions are available: an 80-pin version (reference number M65861FP) and a 44-pin version (M65862FP).
Both versions offer 10-bit digital audio quality (the maximum provided by the MPEG-1 standard) with advanced error-protection features. The design provides for several audio modes of operation - single channel, stereo, dual channel and joint stereo - and a variety of input and output interfaces are included. A standby mode is provided to keep the power consumption to a minimum.

Mitsubishi Electric, Overseas Marketing Division, Tel: +81 3 3218 2863, Fax: +81 3 3218 2852

Philips

DAB452 test receiver and PDE452 test encoder

The *Philips DAB452* test receiver has already been described in **DAB Newsletter No. 6**. The complementary test encoder - *the Philips PDE452* - was subsequently featured in **DAB Newsletter No. 8**. Both units have been installed by more than 80 organizations worldwide since their launch, for use in field trials, DAB demonstrators, R&D etc.
Two options are now available for the DAB452 receiver: an *MMI Bus Protocol* development tool and an *Error Report* output. The first option enables the operator to develop a proprietary user interface and to experiment with special features of the DAB system. The second option enables easy interfacing with logging equipment, for instance in a DAB measurement vehicle. The Error Report output will be standard in versions of the DAB452 receiver released from September 1995 onwards.

DAB chip set

The Philips DAB chip set, described in **DAB Newsletter No. 2**, contains the key components for the Eureka-147 DAB channel and source decoding function. It was developed within the Jessi AE14 project and allows the production of DAB receivers in large quantities and at reasonable prices. It enables DAB to migrate towards consumer markets and is already applied in the DAB452 test receiver and in receivers for large-scale DAB pilot trials.

MPEG audio encoders/decoders

The *Philips MUSICORE* chip set is a real-time ISO/MPEG audio encoder/decoder, exploiting state-of-the-art know-how on psycho-acoustics and audio compression. The chip set has been developed by Philips to enable hardware manufacturers in the field of digital audio compression to make their own MPEG audio products and to develop their own applications. All the specified Layer I and Layer II audio modes, bit rates and sample frequencies are supported. An ancillary data channel is provided and can be- - - used for PAD transmissions. The *Philips MUSICORE* module is a daughter board , the size of a credit card, which contains the MUSICORE chip set.
Philips L BlueTM is a full-featured and high-quality reference codec that encodes and decodes a stereo or 2-channel audio program in full compliance with the ISO/MPEG Layer-II standard. Easy remote operation, full network connectivity, and inter-operability with the installed equipment base, make L Blue the most effective choice for digital networks today. ISO/MPEG and scale-factor error protection, as well as an ancillary data/PAD channel, are provided to assist in the development of DAB applications. L Blue is the result of a cooperation between Philips Sound & Vision Advanced Development Centre (ADC) and MPR Teltech Ltd.
The *Philips Compact MUSICORE Codec (CMC)* is an audio codec board which complies with the MPEG-1 Layer II, MPEG-2 Layer II and G.722 coding standards.
A new set of DAB product leaflets is available from the Philips Sound & Vision ADC. It includes complete technical and commercial data on the *Philips PDE452* test encoder, the *Philips DAB452* test receiver, the *Philips DAB chip set*, the *Philips MUSICORE chip set* and many other product options.

Henk Begas, Project Manager DAB, Philips Sound & Vision ADC, Tel: +31 40 2732080, Fax: +31 40 2737353

TPI GmbH

The Eureka DAB system provides powerful data transport options. With *PAD-Master*, TPI's professional production software, broadcasters can customize the program associated data (PAD) of their audio channels.
PAD-Master features:

- 100? % compatibility with the DAB and ISO standards;
- full support of relevant data formats, such as JPEG, HTML and ITTS;
- powerful scheduling and data management functions;
- built-in PAD player;
- comprehensive online help.

Typically, PAD services consist of different components (e.g. bitmap pictures, hypertext pages, sound clips etc.) which are presented on digital radio receivers. This requires the following tasks to be solved:

- sequencing the data, i.e. finding the right order of transmission;
- repeating the data in order to ensure safe reception;
- synchronizing the data with the audio;
- organizing the data services for easy and flexible access.

Version 1.0 of PAD-Master will be available in December 1995, direct from TPI. It requires a 486 or Pentium PC, and MS Windows software (version 3.1x or higher).
For more information about PAD-Master and other TPI software solutions, please contact:

Dr. Andreas Müller, TPI GmbH, Tel: +49 711 88 11 91, Fax: +49 711 88 767 34

Excerpts from:

Task Force on the Introduction of Digital Radio

(see end for references, sources)

The goal: To find a suitable bandwidth for digital radio

For Canadian researchers, the objective has been to select a frequency band that has the capacity to efficiently transmit both terrestrial- and satellite-based digital radio signals, so that remote areas of Canada can receive coverage comparable to densely populated urban areas.

The AM and FM bands are not practical for digital radio

We believe that moving digital radio into the AM and FM bands simply is not practical. Not only are these bands already crowded, but, as we have seen, they both suffer from interference problems. As well, these bands are impractical for satellite transmissions - the receiving antennas would have to be enormous.
That is why the alliance of Canadian government-industry researches has focused its attention on the 'L-Band'.
Canadian research has proved that L-Band digital radio transmissions have none of the problems associated with AM and FM. In fact, L-band digital radio can be designed to provide interference-free reception even in moving cars and on personal portable radios (whether from terrestrial- or satellite-based transmitters) with none of the distortion or fading common to AM and FM.

Why is the United States not moving on digital radio (L-Band or Otherwise)?

At present, the U.S. domestic L-Band is not available for use by digital radio.
As well, many **American broadcasters have no desire to see this allocation altered**, because they perceive L-Band digital radio as a potential threat to existing radio stations.
In the view of these people, the establishment of L-Band digital radio stations would result in the **creation of a third radio band** (in addition to AM and FM), a new band **whose better-sounding stations would attract revenue away** from conventional AM and FM broadcasters, which are "allegedly" having problems generating sufficient profits in the crowded U.S. radio market.
(This possibility, by the way, is completely avoided by the Canadian government-industry plan to move all Canadian AM and FM stations to L-Band.)
In an effort to head off this perceived threat from L-Band broadcasting, some American entrepreneurs and broadcasters are "trying" to develop a form of digital radio that will work within the existing bandwidths allocated to the AM and FM stations. In other words, they are trying to design a version of digital radio that can be adopted by existing broadcasters without resorting to L-Band.
Known as the '**in-band on-channel**' (**IBOC**) solution, it remains to be proven whether a satisfactory solution can be found for both AM and FM. Although it would be irresponsible to assume that a solution cannot be found, **many radio people worldwide are skeptical that this American initiative can deliver significant improvements.**
For one thing, **most countries want future digital services to be delivered by both satellite- and terrestrially-based transmitters. Due to the transmission properties of AM and FM (outlined earlier), the IBOC system is not practical for satellite use.**
The problem is that even if the IBOC system could be made to perform in the lab, it may not perform in the field. As well, IBOC digital radio **may not be able to overcome the fading and multipath problems associated with FM transmission.** In short, it is **unlikely to outperform in any markedly superior manner conventional analog FM signals, particularly in cars.**
As for AM? Even the reduced bandwidth requirements of compressed digital radio signals may be more than this frequency range can reasonably provide, particularly if it is necessary to transmit both conventional AM and IBOC digital services in the same band. Moreover, local AM broadcasters are subject to severe interference from distant stations during the nighttime hours, which would seriously degrade digital radio performance on this band.
This means that any workable IBOC solution might only be usable in the FM band, which would effectively leave AM stations out in the cold.

Thus, current disparities between AM and FM stations - which have devastated AM operators in the unregulated American marketplace - would only be heightened by such an approach.
By contrast, the Canadian approach benefits both AM and FM. As well, Canadian Radio-television and Telecommunications Commission (CRTC) content regulations and market-entry licensing requirements have ensured some protection for domestic AM broadcasters.
In short, the problem with in-band digital radio is that it does not have the potential to offer significant performance improvements either to broadcasters or listeners. And, obviously, if the public does not perceive digital radio as providing any real improvements, they will not buy the receivers. That is why Canada, backed by solid and substantial research, has elected to go to the wider bandwidth in the L-Band to achieve maximum benefits.

Task Force on the Introduction of Digital Radio

Member

Peter Kruyt (Chair), President, Power Broadcasting Inc
Michael McEwen (Vice Chair), Senior Vice President - Media, Canadian Broadcasting Corporation - representing **Canadian Broadcasting Corporation**
Michael Binder, Assistant Deputy Minister, Spectrum, Information Technologies and Telecommunications, Industry Canada - representing **Industry Canada**
Lucie Gagnon, Secrétaire générale adjointe, Association des radiodiffuseurs communautaires du Québec - representing **Community and Campus and Community Radio**
Vacant - representing **Consumer Electronic Marketers of Canada**
Victor Rabinovitch, Assistant Deputy Minister, Cultural Development and Heritage, Department of Canadian Heritage - representing **Department of Canadian Heritage**
Duff Roman, Vice President, Industry Relations, CHUM Limited - representing **Canadian Association of Broadcasters**
William Sawchuk, Director General, Broadcast Technologies, Research Branch, Communications Research Centre - representing **Joint Technical Committee on Advanced Broadcasting**

Observers

David Basskin, President, Canadian Music Reproduction Rights Agency - representing **Task Force on the Future of the Canadian Music Industry**
David Colville, Commissioner, Canadian Radio-television and Telecommunications Commission - representing **Canadian Radio-television and Telecommunications Commission**

Respectfully Submitted,

David Hollfelder

David Hollfelder
5003 Pack Saddle Pass
Austin, Texas 78745
(Voice) (512) 442-8750
(FAX) (512) 442-8355
e-mail ddr@onr.com

CERTIFICATE OF SERVICE

I, David L. Hollfelder, do hereby certify that a true and correct copy of the foregoing "Reply-Comments on RM-9242" was sent via first class mail, this 26th day of May, 1998, to the following parties:

Henry L. Baumann
Executive Vice-President and General Counsel
NATIONAL ASSOCIATION OF BROADCASTERS
1771 N Street, NW
Washington, D.C. 20036

Counsel for State Broadcasters Associations
Richard R. Zaragoza
David D. Oxenford
FISHER WAYLAND COOPER LEADER & ZARAGOZA L.L.P.
2001 Pennsylvania Ave., N.W., Suite 400
Washington, D.C. 20006-1851

Counsel for USA Digital Radio, L.P.
Robert A. Mazer
Albert Shuldiner
VINSON & ELKINS, L.L.P.
1455 Pennsylvania Ave., N.W.
Washington, D.C. 20004-1008

American Community AM Broadcasters, Inc. (ACAMBA)
Bryan Smeathers, President
P.O. Box 973
Central City, KY 42330

RM-9242 Petitioner
J. Rodger Skinner, Jr. / President
TRA Communications Consultants, Inc.
6431 NW 65th Terrace
Pompano Beach, FL 33067-1546

Respectfully Submitted,

David L. Hollfelder

David Hollfelder